TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3)
Stockholm 8th to 11th March 1999

TSGR2#2(99)112

Agenda Item: 9.3.3

Source: Nokia

Title: **Uplink Allocation and Deallocation**

Document for: Decision

---

1. INTRODUCTION

This paper discusses the signalling messages and parameters required for allocation of uplink capacity for a DCH.

2. REQUESTING UL CAPACITY

2.1 Current working assumption

The current working assumption [S2.03, S2.31] is that UE sends "Traffic measurement reports" to RNC. It is not explicitely defined what triggers these measurement reports. The traffic measurement reports contain the status of (RLC) transmission buffers in UE.

Based on these measurement reports, RNC can allocate capacity for UE for uplink packet data transfer, or request UE to send its data on RACH. (?)

2.2 Proposed addition

It should be possible for the UE not only to report RLC buffer status but instead indicate a bitrate (transport format) it wishes to use for uplink transmission. The available capacity in uplink is anyway measured as interference, thus "bitrate" is more appropriate parameter to calculate the estimated additional interference than "amount of data in buffer". The requested bitrate should be one in the TFS negotiated earlier for the RAB in question.
In the example in this paper we use message name CAPACITY REQUEST for the uplink message.

2.3 Transmission in common UL channel (RACH)

During RACH/FACH state, UE itself should be able to make decision whether to send data packets on RACH or whether to request a DCH (with "Capacity Request"). Otherwise there will be unnecessary signalling in RACH/FACH before UE can send a data packet on RACH channel. The exact algorithm and parameters used for this channel type selection are FFS *(the current values for the parameters could be broadcasted e.g. on BCH. The channel type selection could be based e.g. on maximum allowed data packet size on RACH, current cell load etc.).*

3. ALLOCATING UL CAPACITY

3.1 Current working assumption

With the existing procedures and parameters [S2.03, S2.31] the capacity allocation for a UE that has sent a CAPACITY REQUEST on RACH would need two messages from UTRAN to UE:

- PHYSICAL CHANNEL RECONFIGURE to allocate a channelization code for the UE

- TRANSPORT FORMAT COMBINATION CONTROL to restrict the available TFCS for the UE (*unless the UE asked for the highest bitrate in the TFS*)

3.2 Proposed modification

Modify parameters of TRANSPORT CHANNEL RECONFIGURATION message as described in chapter 6 of this contribution so that this message can be used to allocate DCH capacity for UE in RACH/FACH state (= contains the functionality of the current PHYSICAL CHANNEL RECONFIGURE and TRANSPORT FORMAT COMBINATION CONTROL messages).

4. DEALLOCATION OF UL CAPACITY

4.1 Current working assumption

With the existing procedures and parameters [S2.03, S2.31] the network should decide based on Traffic Measurement Reports (received from UE) when the DCH should be deallocated and UE moved to CCH state (with PHYSICAL CHANNEL RECONFIGURE message ?).

4.2 Proposed modification

The existing solution is naturally possible. However, it should be possible to measure the uplink traffic in the RNC without the need to signal traffic measurement reports from UE, otherwise the needed signalling can be quite high. Thus, when the SRNC gets a report from its own MAC layer that there is no more data in this RAB, it can deallocate the physical channel from UE.

To include the Control-Only substate as introduced in [S2.03], we propose that the release would be done with TRANSPORT CHANNEL RECONFIGURATION message. The message in this case should :

a) restrict the TFCS so that only signalling is possible = UE is moved to "Control Only Substate" [S2.03]
b) include a timer value how long UE must stay in the c-only state before it has to switch to RACH/FACH.
c) (optionally) include indication which cell the UE should select when changing to RACH/FACH state and (optionally) new RNTI to be used in the RACH/FACH state
d) (optionally) include cell/RNTI information for several cells
e) (optionally) include RACH/FACH configuration of the proposed cells

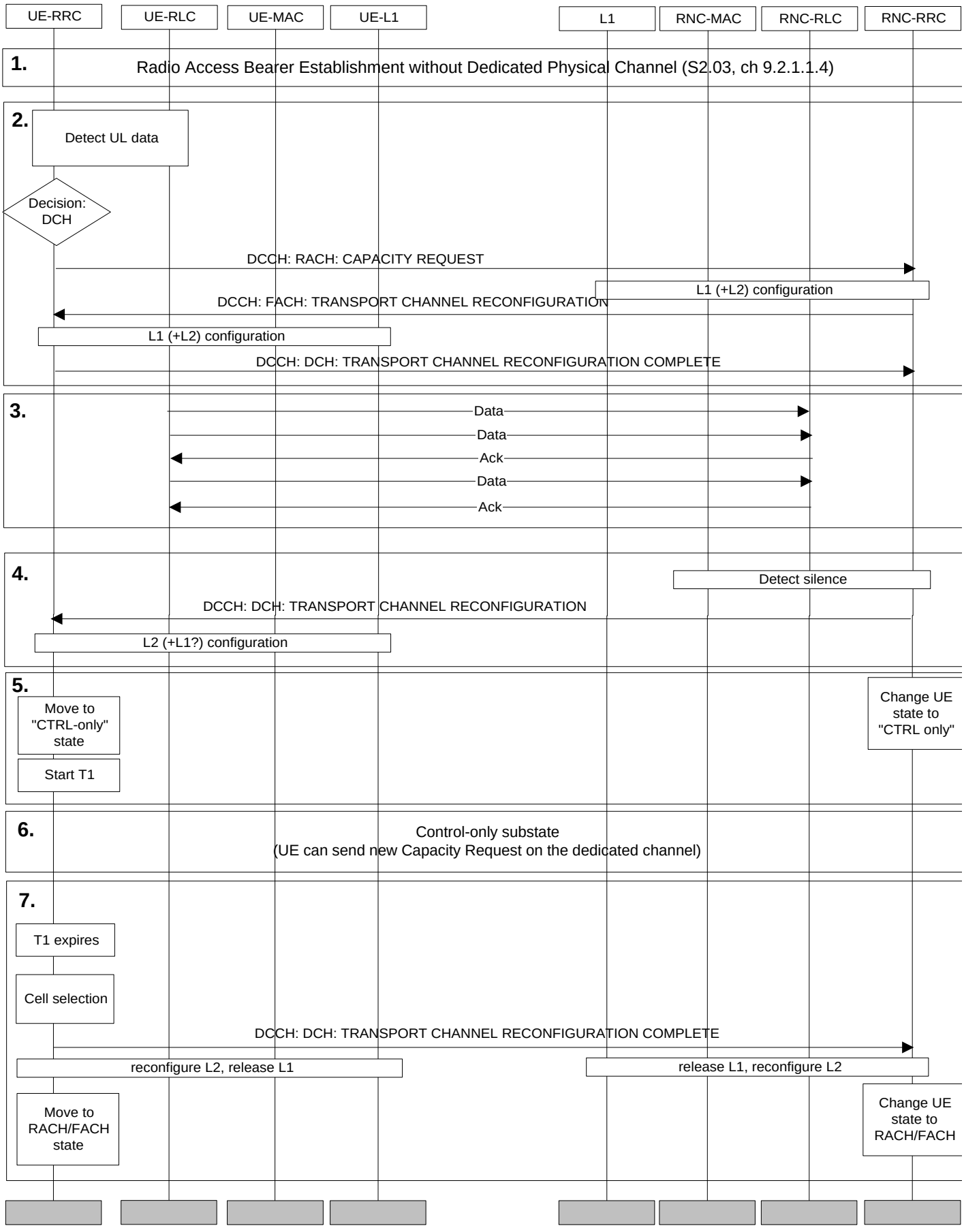
If no new data arrives during the control-only timer period, UE sends TRANSPORT CHANNEL RECONFIGURATION COMPLETE message to SRNC and moves to CCH state. The message may contain cell-id that the UE has selected for the CCH state.
If there is new data to be sent in UL during the control-only period, the UE sends new CAPACITY REQUEST message to UTRAN

5. EXAMPLE SIGNALLING PROCEDURE

Figure 1 shows one example signalling flow where:

- UE is initially in RACH/FACH state having one RAB, but no physical channel
- UE requests uplink capacity
- RNC allocates capacity for UE
- Uplink data transmission in the allocated DCH
- RNC detects silence in the RAB and requests UE to move to control-only state

- After control-only timer expires, UE sends a Transport Channel Reconfiguration Complete message to RNC and moves to RACH/FACH state. This message is sent in unacknowledged mode.


UE-RRC
UE-RLC
UE-MAC
UE-L1
L1
RNC-MAC
RNC-RLC
RNC-RRC
1.
Radio Access Bearer Establishment without Dedicated Physical Channel (S2.03, ch 9.2.1.1.4)
2.
Detect UL data
Decision: DCH
DCCH: RACH: CAPACITY REQUEST
L1 (+L2) configuration
DCCH: FACH: TRANSPORT CHANNEL RECONFIGURATION
L1 (+L2) configuration
DCCH: DCH: TRANSPORT CHANNEL RECONFIGURATION COMPLETE
3.
Data
Data
Ack
Data
Ack
4.
Detect silence
DCCH: DCH: TRANSPORT CHANNEL RECONFIGURATION
L2 (+L1?) configuration
5.
Move to "CTRL-only" state
Start T1
Change UE state to "CTRL only"
6.
Control-only substate
(UE can send new Capacity Request on the dedicated channel)
7.
T1 expires
Cell selection
DCCH: DCH: TRANSPORT CHANNEL RECONFIGURATION COMPLETE
reconfigure L2, release L1
release L1, reconfigure L2
Move to RACH/FACH state
Change UE state to RACH/FACH

6. MESSAGE DEFINITIONS

6.1 Capacity Request

This message is sent from UE to UTRAN to request for transmission capacity for a DCH.

Logical channel: DCCH
Direction: UE → UTRAN

Information element category	Information elements	REFERENCE	TYPE	NOTE
	Message Type		M	
RAB information elements	RAB ID		M	FFS whether it should be possible to ask capacity for several RABs with one message.
Transport CH Information elements	TF		O	Transport format from the earli negotiated TFS indicating the bitrate UE is requesting. If this IE is missing, the TF with the maximum bitrate of the TFS is assumed.
Measurement Information Elements	Measurement Results		O	FFS if this is needed (to allow setting up DHO)

6.2

Transport Channel Reconfiguration

When this message is used as a reply to Capacity Request, the function is to allocate physical channel and set TFC subset.
When this message is used to move UE to control-only state, it contains a parameter indicating how long UE should stay in the control-only state.

Logical channel: DCCH
Direction: UTRAN → UE

Information element category	Information elements	REFERENCE	TYPE	NOTE
	Message Type		M	
UE Information elements	Activation time		M	
	CTRL Only State Timer Value		O	If this is not included, UE does not move to control-only state.
	Cell/RNTI information		O	FFS. Can be used to assist UE in cell selection when changing from DCH to CCH.
Transport CH Information elements	DCH id		M	
	TFS		O	(Not included in the example flows)
	TFCS		O	(Not included in the example flows)
	TFC Subset		O	If not included then whole TFC can be used by UE.
PhyCH information elements (details ffs)				

6.3 Transport Channel Reconfiguration Complete

Logical channel: DCCH
Direction: UE → UTRAN

Information element category	Information elements	REFERENCE	TYPE	NOTE
	Message Type		M	
	DCH id		M	
	Cell id		O	If UE is moved to RACH/FACH state it may include a cell id to indicate to which cell it will change.

7. PROPOSAL

Incorporate new elementary procedure "Capacity Request" into S2.31 or include the functionality into some existing messages(??).

Incorporate new parameters for TRANSPORT CHANNEL RECONFIGURE and TRANSPORT CHANNEL RECONFIGURE COMPLETE messages from chapter 6.

Incorporate functionality described in chapters 2.2, 2.3, 4.2 into relevant parts of S2.31 and S2.03. (Other possible documents ffs.)